

# ANATOMY OF AN IMPACT

## MATERIALS

Each group will need

- copies of crater photographs (two for each group)
- drawing paper
- pencils
- model craters

## OBJECTIVE

In this activity you will use photographs to examine basic features of craters and to develop skills for reconstructing events from evidence left behind.

## BACKGROUND

In the previous two activities, you worked with models. Models are important tools in scientific research. When objects under study are too far away, too large, or too small to be investigated directly, models offer useful starting points for scientists. They provide a means for representing objects and phenomena so that research onto them can begin. Models also have important roles in verification. When objects cannot be tested directly, models can be used in their place. To test how a plane would react to certain atmospheric conditions, for example, engineers model those conditions in wind tunnels and test plane replicas in simulation. Likewise, to test what happens to people in auto accidents, crash test dummies are used as models. Because you could not go to the Moon to examine craters firsthand, in the last two activities you worked with crater models.

Always be aware, however, that no matter how useful models are, they are never exact replicas of the objects they simulate. Sometimes models are not reliable indicators of how the original object will react. Models in architecture are good examples. A tabletop replica of a bridge, for instance, can withstand more relative force applied to one spot than can a full-sized bridge. A *scale erect* occurs that makes the tabletop model unreliable. The best way to verify a model's appropriateness is to compare it as best you can to the original. Always proceed cautiously when drawing conclusions about an object from information gained through a model.



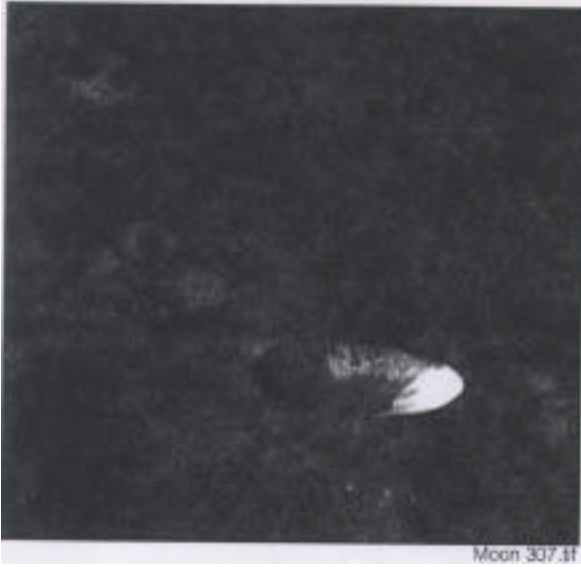
The face of the Moon contains many major impact sites. Five of these are located here using arrows.

In this activity, you will apply the experience of working with crater models from Activities 3 and 4 to real cases of impact sites. Using photographs of craters provided here and by your teacher, you will investigate the anatomy of craters and compare them to a model—like the ones you made in earlier activities—that your teacher has on display. In the process of this close study, you should be thinking about how to use the evidence left behind to reconstruct the actual impact event. What happens to make a crater appear the way it does?

## PROCEDURE

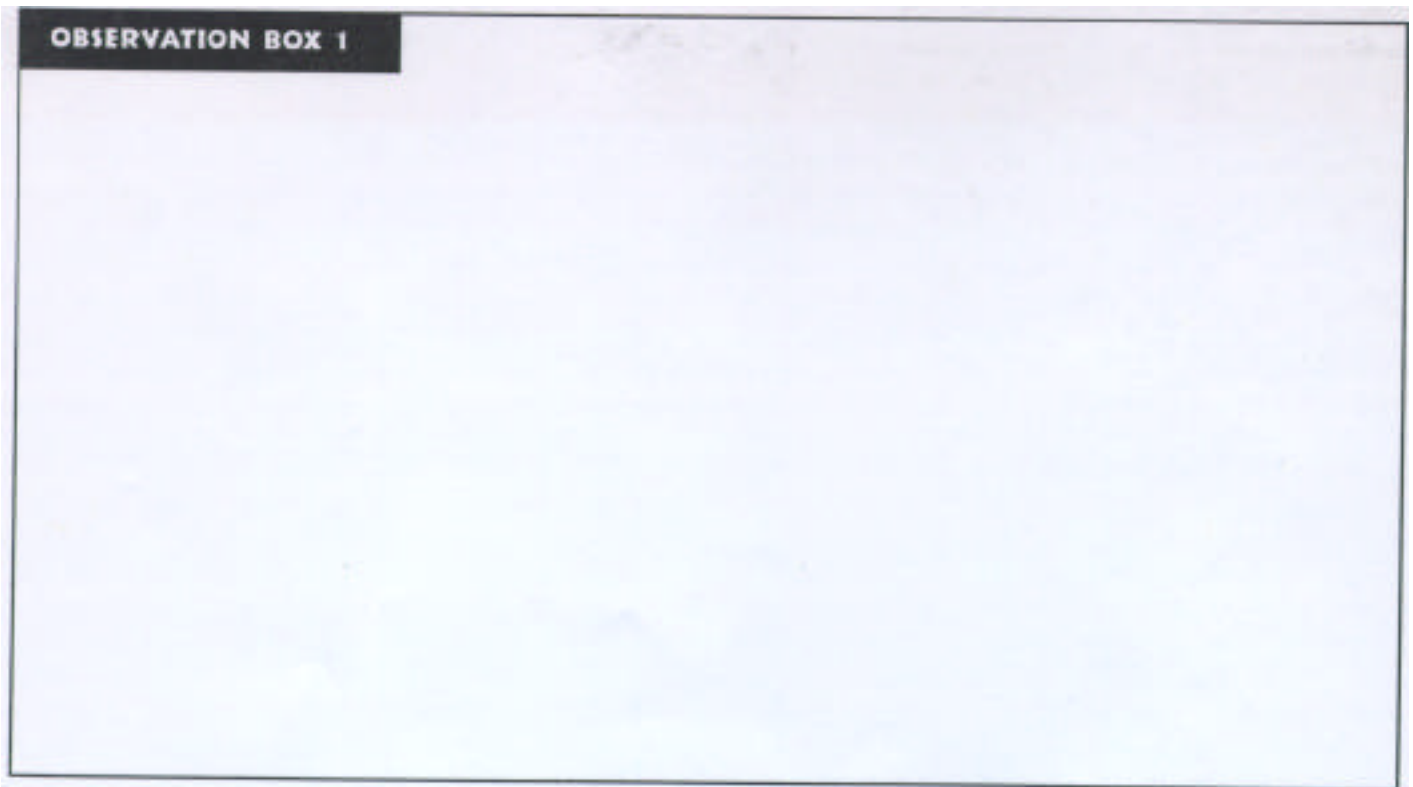
### Observing a Crater

1. Working by yourself, examine the large craters in the images presented here and made available by your teacher. Identify the major features you observe. Also think about how you can reconstruct the original impact events given the evidence you have available.



Close-up of a relatively fresh crater. This view comes from looking down on the Moon at an oblique angle.

2. In Observation Box 1, create a basic sketch of an impact crater based on your study of the photographs. Label key features. Be sure to look for patterns that can shed light on the impact process itself.



## Comparing Notes

3. Reassemble in your group and compare results. What features did everyone identify as part of the labeled craters? Discuss any differences between your general sketches. Also, discuss how the various features of a impact site could have been created. (Remember, members of your group may disagree about how features you observe were caused. Disagreements are a normal part of scientific investigations. If such differences occur, discuss how to design a test that would expand your understanding of the phenomenon.)

4. Look at photos of heavily-cratered surfaces. Can you find examples of a crater on top of another? Which crater formed first?

5. Use your generalized sketches to reconstruct the process of a crater's impact on a surface. Write a chronology of events taking place during an impact. Be sure to include processes that account for all the features identified on your generalized sketch.



*Heavily cratered surface on the Moon. This is an old region whose surface has been exposed for about 4 billion years. Therefore, it has accumulated many impact craters.*

## Comparing Reality to Models

6. At this point, look at the crater model your teacher has prepared. It was made in a similar way to how you made craters in earlier activities. Study the craters under different angles of lighting. Compare the photographs of real craters to the model and create a list of similarities and differences between your model and photographs of the real thing.

## QUESTIONS/CONCLUSIONS

1. Being able to visualize natural processes is key to scientific research. Compare your crater with the diagram illustrating a bolide impact (your teacher will provide this) and write a paragraph describing a bolide impact and the cratering process as if you were narrating a film showing what happens during an impact event. Be sure to include in your narration explanations for how each of the elements in your generalized sketch was created.
2. Is the crater model a good representation of a real impact site? How is it realistic? How is it unrealistic?
3. Suggest ways for improving the model. How would you make it more realistic?